# Auditory Brainstem Implant (ABI)

Bellingham HLA

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# Auditory Brainstem Implants

- What is an ABI?
- ABI vs. CI
- ABI history
- Who is a candidate?
- Expected outcomes

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# What is an ABI?

- An ABI is similar to a cochlear implant, but instead of inserting electrodes into the cochlea, the electrode array is placed on the surface of the brainstem.
- The ABI bypasses the entire outer, middle & inner ear as well as the 8th (auditory) nerve
- The ABI directly stimulates the brainstem
- The ABI uses a standard CI speech processor

# Normal Hearing

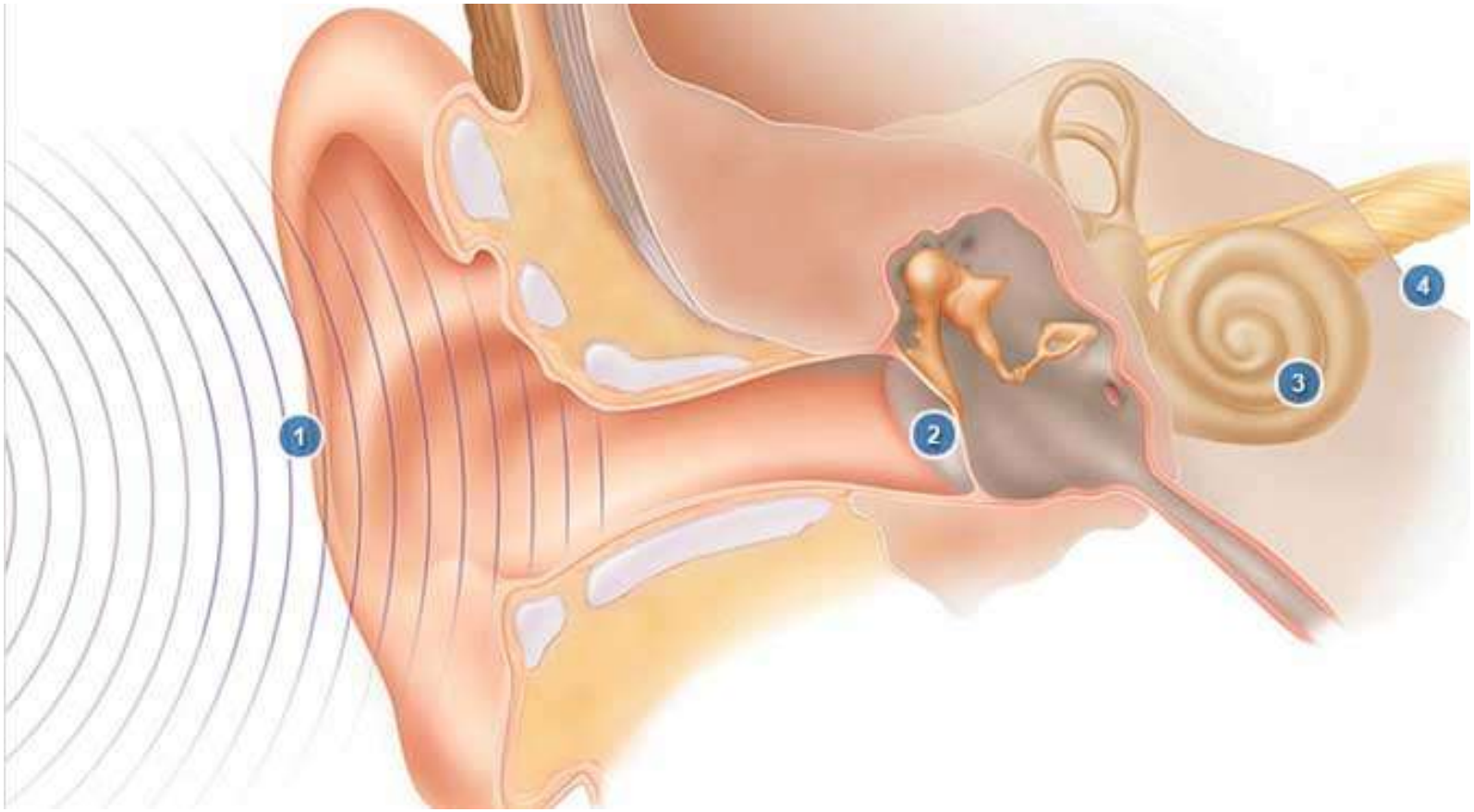



Photo courtesy of Cochlear Americas

# Hearing with a Cochlear Implant

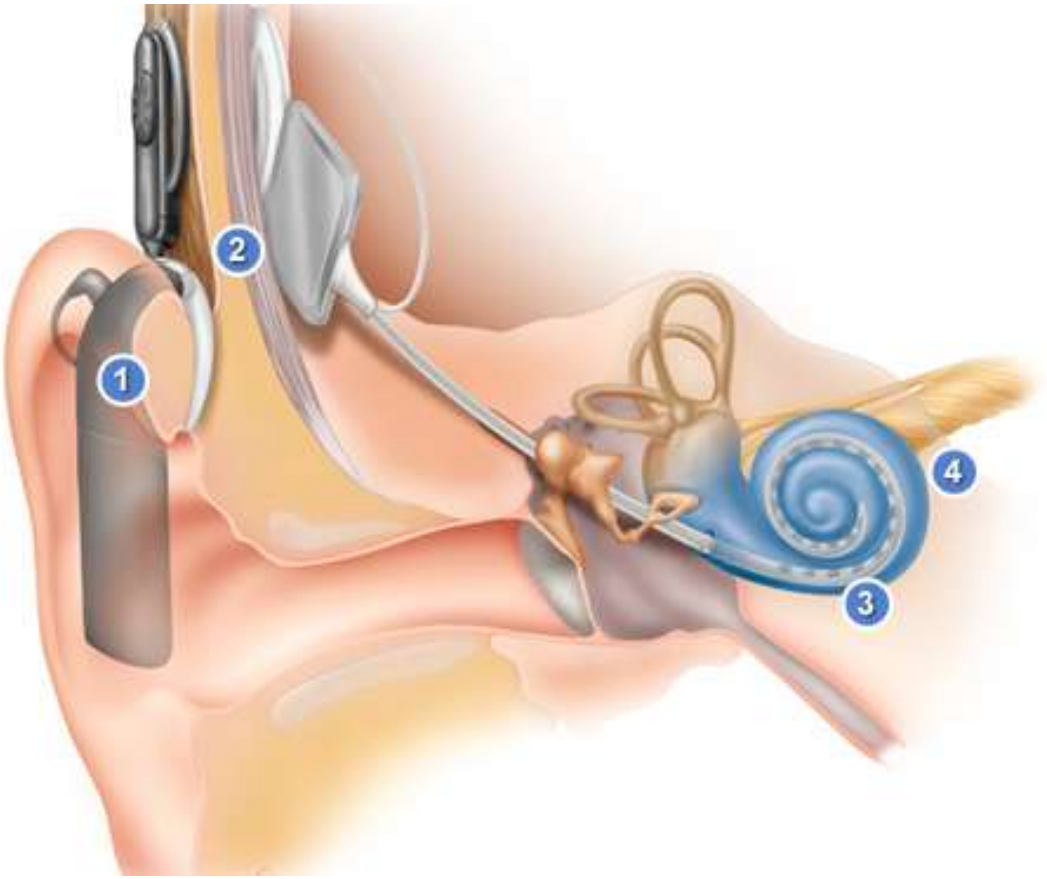



Photo courtesy of Cochlear Americas

# Hearing with an ABI

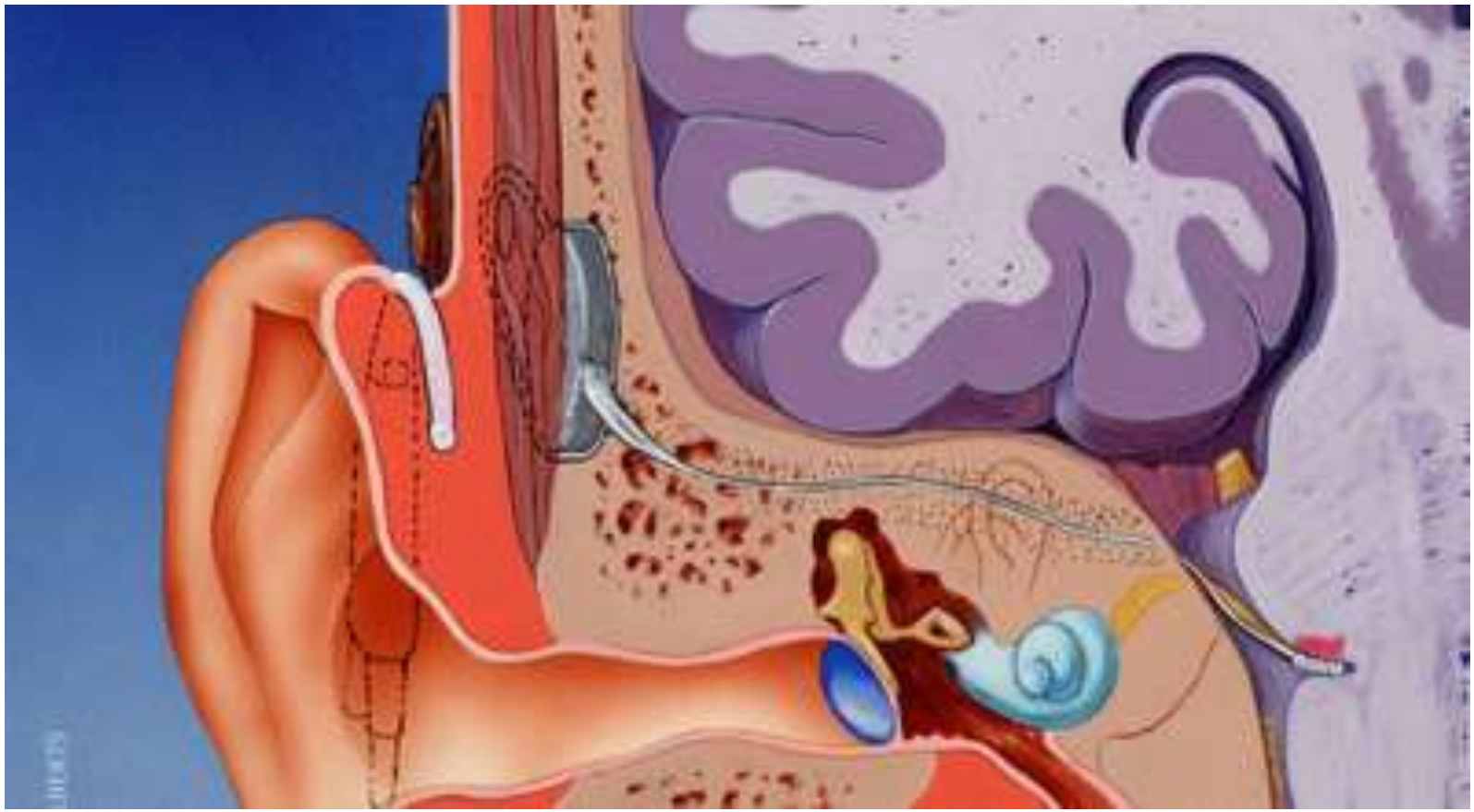
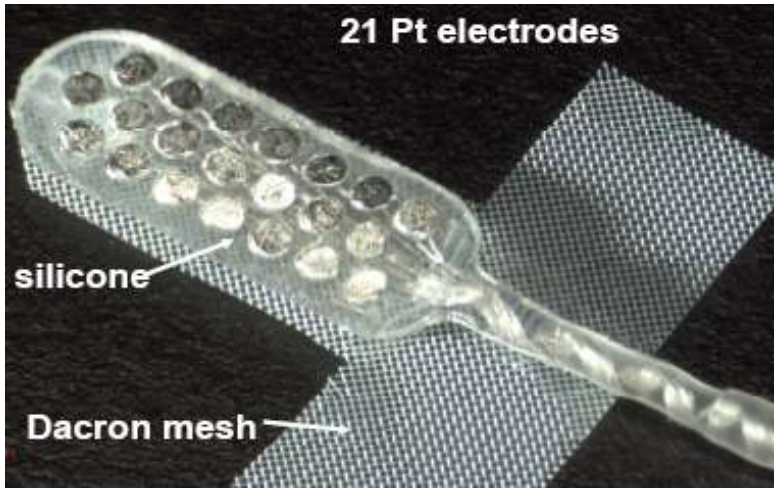


Photo courtesy of Cochlear Americas




- 21 electrode contacts
- Arranged on a t-shaped decron mesh
- 0.7 mm diameter

Photo courtesy of Cochlear Americas

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# ABI vs. CI

## Similarities

- Uses the same internal receiver/stimulator
- Uses the same external speech processor (currently using a Freedom processor)

## Differences

- Uses a different electrode array
- Placed in a different position (cochlea vs. brainstem)
- Non-magnet plug placed in the receiver/stimulator
  - Requires the use of a surface (sticker-like) magnet

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# ABI History

- The 1st ABI device was developed by Drs. William House and William Hitselberger in 1979
- The original ABI was a single channel device with a ball-type electrode & was powered by a modified hearing aid through percutaneous signal transmission.
- The 1st ABI clinical trial was in 1986 using a single channel plate electrode with percutaneous (early cases) and transcutaneous (later cases) signal transmission
- The multichannel (8 ch) ABI was developed in 1992-93 and the first multi-site clinical trial was in 1994.
- FDA approved the Nucleus 24 ABI in October, 2000

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# ABI Candidates

- Patients diagnosed with NF2
- 12 years of age or older
- Medically and psychologically suitable

**No audiologic criteria indicated for ABI candidates**

# What is NF2?

- Neurofibramatosis Type 2
- Characterized by benign bilateral acoustic tumors and numerous central nervous system tumors
- Incidence: 1 in 40,000 live births
- Affects both genders equally
- An autosomal dominant genetic disorder
- Offspring of an affected parent have a 50% chance of inheriting the gene

# NF2, con't

- While NF2 is a genetic disorder, many patients (roughly half) have no family history of NF2 – they have spontaneous genetic mutations
- NF2 is often diagnosed around 22-23 years of age
- It is estimated that there is a 7 year gap from the first symptoms to NF2 diagnosis
- Symptoms:
  - 1/3 of patients present with ear symptoms (HL/balance problems)
  - 1/3 of patients present with ataxia (uncoordinated movement) or headaches
  - 1/3 of patients are asymptomatic

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# Expected outcomes with an ABI

- Roughly 80% of ABI recipients will receive auditory benefit from their ABI
- When the ABI is used in conjunction with lip-reading, approximately 85% of patients will demonstrate improved speech discrimination performance at 3-6 months post-activation
- Around 10-15% of patients will receive improved open-set speech recognition scores in quiet
- Approximately 10% of ABI recipients report little to no auditory benefit from use of their ABI

# Non-auditory side effects

- Many patients will experience non-auditory side effects with activation of certain electrodes
- There may be mixed (auditory and non-auditory) stimulation
- Non-auditory side effects (NSE) occur because the ABI is placed on the brainstem –an area where many other nerves convene.
- When NSE are present, they tend to occur in the following areas (listed in order of occurrence):
  - Head/neck
  - Shoulder/arm/hand
  - Abdomen
  - Hip/leg/foot